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Engineers Employability Competency: Employer Perspective

Abstract
The objectives of this study is to assess whether the suggested lack of interpersonal and enterprise skills competencies cause unemployment amongst engineering graduates in Malaysia. Critically appraise if engineering undergraduates have received a quality work placement (appropriate to their learning, knowledge and employability skills) and to enhance in interpersonal and enterprise skills competencies awareness amongst engineering undergraduates in Malaysia. This study will employ qualitative method. An interview questionnaire adapted from Course Experience Questionnaire (CEQ), Australia (Ramsden, 1991) and combination of L. Harvey (2001), generic skill criteria for workplace framework will be utilized to suit the research purpose. The result from the interview will be interpreted. The qualitative result revealed that the employers generally had delivered working exposure to the industrial training trainees.

Keywords:
Engineering, employability, competency, employer

Introduction-The engineer's nature of work.

Getting a new product into the market is more than just having a few parts made. It is done through a process called "Product Development". The process starts with the needs from customer, to having the bright idea, to having the desirable product in hand. Development of the bright idea into a final product is a process involving thinking through issues and adaptations, working out details and specifications- like how can it be made, the exact materials, possible failure modes, required regulations and more.

Coordination in engineering has been observed as an important and pervasive characteristic within a number of interpretations of approaches to engineering

management; for example, models of the engineering design process (Ray, 1985 and Cross, 1994), concurrent engineering (Handfield, 1994; Duffy et.al., 1993, McCord and Eppinger, 1993, Prasad, 1996, Perrin, 1997, Coates et. al 1999a; Ainscough and Yazdine; 1999) and project management (Fayol, 1949; Oberlender, 1993, Bailetti et.al., 1994, Cleetus et.al 1996, Lock, 1996). Indeed, coordination has been identified as being significant in several other approaches such as work flow management (Alonso et.al, 1996, Yu, 1996, Piccinelli 1998 and Shan 1999), design integration (Hansen, 1995) and computer-supported cooperative work (Malone and Crowston, 1994, Schal, 1996). In any coordinated work, a lot of communication is needed. Therefore, interpersonal skill is important to maintain coordination and work flow amongst engineers (Coates, 2004).

In the modern manufacturing organization, it is axiomatic that serving manufacturing needs will also serve market needs due to the required responsiveness to customers. One danger of the traditional engineering approach, which is centered on product design for function only, is that the business organization encourages designers to indulge themselves in engineering design and less in communication and assessing the overall needs to be served (Abdul-Shukor, 2003).

The importance of interpersonal and enterprise skills development

In addressing the importance of interpersonal and enterprise skills development, there are industry cases that demonstrate the need to improve the related skills. There is a high failure rate of new product development (NPD) reported by Balachandra and Friar (1997) who stated that almost 90 % of products introduced in 1991 did not reach their business objectives (Souder and Sherman, 1994; Schilling and Hill, 1998; Cooper, 2005; and Yahya et. al, 2007).

There are many studies regarding the appropriate approach to delivering the skills needed by employers or in the workplace (Harvey, 2001; Quek, 2005; Dench, 1997; Andersen, 2004) to the undergraduate but those dealing with individual capability are non exhaustive. There are also arguments on how to balance the academic curriculum and generic skills (Quek, 2005; Holden, et.al., 2004; Morse, 2006). However, both employers and academics have different terms, definitions and perceptions of generic skills (Dench, 1997,). With the contrasting opinions from both parties, the transfer of generic skills can be difficult.

Status of unemployment amongst Malaysian engineering graduates

An online survey done by the National Economic Action Council (MTEN) in 2006 reported that out of 7,370 graduates in the engineering field who responded to an online survey only 4,035 were working and 3,335 were unemployed. It is important to note that in Malaysia access to the internet is very limited particularly in poor, rural and isolated regions. Internet installation in their homes can be very expensive for many Malaysians. Cyber café's normally provide relatively cheap but restrictive access. Therefore, the number of engineering graduates responses is not representative of the whole population of engineering graduates educated in the Malaysian higher education institutions (HEI).

This study will only focus on the engineering graduates with degrees as they are qualified to take up employment in supervisory, managerial and generally higher positions.

In Malaysia it is generally assumed that an engineering graduate can easily gain employment because of their professional status as compared to graduates from the arts. It is suggested that they should not have any difficulty to be employed compare to the non-engineering graduates. The survey indicated otherwise, where 67.1% of engineering graduates have a waiting period of less than 3 months to be employed, 14.3 % wait for about 6 months in a period of unemployment and in some cases more than 6 months.

Aims and scope of research

The aim of this study is to explore whether the suggested lack of interpersonal and enterprise skills competencies cause unemployment amongst engineering graduates in Malaysia. The researcher intended to gain information and appraise whether engineering undergraduates have received a quality work placement (appropriate to their learning, knowledge and employability skills) and to the needs of the workplace. The researchers' interest is to examine the extent of the engineering programme, industrial training and university life and co-curriculum activities offered to engineering students. Do these schemes help to promote interpersonal skills and entrepreneurial skills towards employability? The researcher considering employing a questionnaire survey to explore the situation under study.

Methodology

These study employed Generic Transfer Questionnaire (GTQ) adopted from the framework of Course Experience Questionnaire (CEQ) (Ramsden, 1999) Australia and justification of interpersonal and enterprise skills characteristic used in the GTQ questionnaire established by Harvey (2001) employability framework. The GTQ measured whether the engineering degree programmes, industrial training, co-curriculum activity and university life has increased the engineering students'

interpersonal skills and enterprise skills. Exploratory factor analysis was used to test the validity and reliability of the proposed methodology and measurement tool.

Through stratified random sampling employers in Malaysia are chosen to participate in this study. Stratified random sampling is a method for obtaining a sample with a greater degree of representativeness. 16 employers responded to the questionnaires distributed through e-mail, and fax. The companies are involved in various operations such as semiconductor manufacture, aircraft maintenance and service, manufacturing, oil business, tunnel construction, housing development, electronic manufacturing, pressure gauge manufacturing, automation and control solutions and industrial processes such as electrical power generation, sea port container handling, automotive industries, and fertilizer manufacturer. The survey data will be excluded from this paper.

This research question concerns the meaning of a phenomenon eliciting the essence of experiences. The method that best answers the question is phenomenology (Bergum,1991; Giorgi, 1970 and van Manen, 1984, 1990). The employer data would reflect the experience of the employers, developing the undergraduate engineers during the industrial training.

Data presentation and discussion

Out of 16 employers participants, two companies volunteered for interview in this study,
and they are the company AMSB, an aeronautical company and HMMSB, a Japanese automotive industry company.

AMSB has been in operation since 1985. Their representative was the manager of the Human Resource department. She has been responsible for arranging industrial training for almost 10 years. In a year they normally allocate a quota of twenty student/trainees. This is because the company gives an allowance to the trainees and they have to meet their budgets.

HMMSB has been in operation for four years. Their representative was also the manager of the Human Resource department. This company sets an allocation of 5 student/ trainees per year. The trainee numbers are low because the organization does not allocate a specific person to handle practical training. As a consequence the trainees may have difficulties in their placement activity and this may defeat the training objective if the trainees do not get a proper industrial training task.

This section displays the interview feedback by both the employer respondents. AMSB's response to the opinion of industrial training is that they feel responsible to accept students from universities to come to their company and also as a part of their contribution to the nation. While HMMSB's response was that it is very important to the student but for the employer it can be a burden if there is no proper system to monitor the training process of the student.

Both AMSB and HMMSB agree that the duration of industrial training ranges from 2 months to 5 months fixed by the universities. AMSB does not agree on the duration because they feel that the majority of students who come to AMSB are not from an aeronautical background but are engineers, therefore, the 3 months period is simply not enough. Due to the infrastructure of the subject they are learning it is not sufficient for the student. As for HMMSB, the period is not an issue, but the student's initiative to learn is more important than having 6 months training but for the student to just sit and learn nothing valuable for employability.

As for the response to the question on the industry requirements from the engineering graduate, AMSB stated that these include a bachelor's degree in the area, for example, Mechanical Engineering majoring in aeronautics. Basic engineering software skills AutoCAD is also required and a few others in aeronautics. For a fresh graduate then basic training in aeronautics is a minimum requirement. Experience in a related field, with Malaysia Airline System (MAS), or any aviation company is an advantage. Generic skills like a good command of English, good communication skills, technical English, being proactive and with good initiative and commitment towards the company are expected. As for HMMSB, the industrial training student is interviewed initially; the students are then short listed for training. During the interview, they actually assess the applicant's willingness to learn, by giving them a set of objectives.

Both companies were asked about the importance in recruiting engineers and whether the company has a practice to select on the basis of degree or generic skills. AMSB specified leadership quality; quoting they are looking for a dynamic kind of person, presentable as an aircraft engineer. The nature of engineers working at AMSB is that they are not doing one job but multi tasking. They are handling a number of projects at the same time, so they must have knowledge in project management. If they know about critical path analysis, they have an advantage because they are going to be better able to monitor the project. Problem solving and attending meetings are not required as much because they are fresh graduate engineers. They have their senior engineer as their superior, so they have their own boundaries. As for HMMSB the company normally looks at experience. For a fresh graduate, they normally prefer a Japanese speaker. If the applicant is not a Japanese speaker they consider the applicants other experience.

Both employers were asked whether the cause of unemployment amongst engineering graduates is because of a lack of interpersonal skills or enterprise skills. AMSB responded through her observations, that when they have been trained as a university graduate in whatever field, the problem in the Malaysian industries is on this basis:

i. There are not many aviation companies in Malaysia.

The sector is very small. After graduation, the students apply for a job in this field but the market is too small and then they are forced to accept jobs in other field perhaps in sales or administration. Therefore, there is a mismatch between jobs and the skills. Technical knowledge is then lost to the field and the country. Therefore, the cause is not that they do want to work but because the market is limited in the country.

ii. Lack of interpersonal skills.
The trainees have little participation in industrial training classes. They do not have confidence to give their opinion. She thought that they have lots of ideas but the level of confidence is low. AMSB thought that the trainees are not brave enough to speak or communicate in English.

iii. Enterprise skills.
The nature of learning and the working process of engineers is that they learn a lot of theory and they do practical work during their industrial training. They are used to the method or approach of learning. Therefore, when they are ready for work, they just follow the manual. The trainees are not daring to use the skills and knowledge they have learned in universities to apply or build something. Innovation and creativity is about building or creating something. Added AMSB there are two possibilities as to why this happens:

a) Maybe the market itself or its surroundings do not encourage. Therefore, the employees were not asked to design new projects or products. This would suggest that it is not their fault.
b) Small or limited job availability in this field means they may have to enter administrative work which is totally different from the original qualification in aeronautics. Therefore, they will not be exposed to enterprise skills in this field.

HMMSB quoted the lack of enterprise skill and also lack of practical knowledge as causes of unemployment among engineering graduates. There is evidence that the engineering graduates cannot apply the theory to the real work place. HMMSB suggested the engineering syllabus should have emphasis on the technical aspects and its applications as done in polytechnic colleges.

A further question was put to HMMSB that according to the researcher understands, the polytechnic produces Diploma holders for the technician level whereas the university produces graduates for supervising or managerial roles. These graduates should have some theoretical, practical and generic skill. The HMMSB responded that in their company they believe an engineer must start from the ground level. Although they employ a new engineer, the person will have to go through a lot of on the job training before they can be considered as an engineer.

For the question of priority or importance placed on generic skills in the company, AMSB gave a positive response. They have 2 sets of training; technical skills and soft skills. This is because they want the employee to acquire a balanced set of skills; especially the engineers. They want to optimise the career path of their engineers, therefore the generic skills are important to them. In AMSB they have two kinds of training:

i. technical skills; is a compilation of basic aircraft engineering.
ii. soft skills training; comprises of communication skills, leadership development, human value and generic competency.

So, if the students are employed in their company, they will be given maximum training in techniques about air legislation and basic engineering. They are also trained in the basic requirement of supervisory development skills; such as how to do planning, critical thinking, leadership, motivation skills, communication and how to

write for business. For HMMSB, on the other hand, they treat the interpersonal skills through the process of team work. This basic training is different from what they learn in universities.

Both the respondents were asked the question whether the task given to the student in the industrial training was appropriate to employability and to academic requirements. She agrees it is very important and critical. Out of 20 trainees from industrial training, around 4 will be employed by AMSB. Normally, before the trainees leave AMSB, they will fill in the company employment form. The company feels that the practical training provided encouraged them to work with AMSB. Practical training provides very good trainees with a good reputation for prospective employers but the only disadvantage is that the duration is short. Most of the students who came to HMMSB did not use what they studied in the university. If they are a mechanical engineer and are inside the engineering department, they do more paper-work or research than doing the "real thing". At the end of the training session they are asked to write a report on the things they have learnt especially on the interpersonal skills, such as how to negotiate with bosses and how to get cooperation from their colleagues.

As to the response to suggestions of better ways of transferring employability skills to the engineering graduate, AMSB did discuss this with their CEO during the student's work experience. As a company and employer, they should provide a systematic module for the practical training that is standard for industrial training. They can then have a specific measurement tool that can be beneficial to the ministry of higher education. Their intention therefore was to design a standard module. Currently, they only do the scheduling and ensure trainees gain valuable work experience in the departments. Nonetheless they still feel that this is not sufficient as there is lack of regular communication. They will need some duration or time line to develop a standard module. That is the constraint. If they have a certain module, they will only be able to offer the course to specific universities. This is because they want to correlate their modules with what they study at university. Once chosen, they have a standard module which relates to what they have studied at the particular university. This can be a better way in transferring data and close collaboration with the university. At HMMSB, similarly trainees were asked to write a report of what they have learnt and achieved in the company. Normally, the response is positive. HMMSB suggested that when they come for industrial training, this company must appoint a mentor. Currently, although there is practical training in the HMMSB manager's department, there is no specific person to guide them. So it is still based on the initiative of the trainee to learn. He emphasised that practical training is of a second priority, the emphasis must be more on production. If the company's personnel are too busy with their work, they do not think about sacrificing their time to teach a trainee.

In response to a question on collaboration with the university regarding the industrial training, AMSB stated that the university should give a list of generic skills competencies of their students included in their CV. With this information the company can accurately assess the suitability of the trainees and define an appropriate project. The researcher found that it might be a problem if the measurement tool came from the university because it might be general. It would be wise, if employers

could provide the categories they wanted to look at according to their needs. Therefore, industry and the university can look into this matter for further development.

Answering the same question, currently HMMSB collaborates with Japanese University. They currently do not have collaboration with local universities. At a lower level of the company they have collaboration with Malaysian lower technical institutions, such as the National Vocational Training Council (MLVK) or Industrial Training Institute (ILP), but at engineer level they currently have no links. Normal practice in Japanese companies is to recruit engineers from Japanese universities.

With regard to the question to AMSB on the issue of lack of communication between the university and the company, their comments and suggestions regarding this matter are about when the university representatives make their visit to the company. AMSB reported that the university have several representatives to handle the trainee's issues during in industrial training and therefore, it causes a problem to the company when there was a problem, they wanted to solve it simply but find that they are passed from person to person. The administrative issues have to be transparent. The collaboration should happen in a more professional way. Rather than the university representative visiting the company, ask to see the students log book; acknowledge the trainee's task and industry supervisor and they can go on without consulting the industry. If there is anything they should discuss relating to issues in industrial training for the benefit of both parties they can meet. AMSB appreciate steps taken by one of the universities that once a year called them, held a forum with the administration, the lecturers, faculty and coordinators and they discuss issues for the benefit of industrial training. AMSB urged other universities to follow this step rather than communicate only through letters. Good relationships and collaboration between university and industry would be an advantage for the students in future training.

HMMSB chose the Japanese University because of a managerial decision. The Japanese universities have collaboration with H Company, Japan, therefore they appointed HMMSB as the venue for trainees.

On the question of the future needs of industry, AMSB mentioned that future needs in aeronautics are very demanding. They have a deficiency to start a project in the Subang area. Towards the year 2010, Malaysia will be facing a problem because of the loss expertise in this field either they work in other country or they have left the field for other job options. As for HMMSB, the trainees need to know how to promote themselves. Sometimes it is unfair for a student with very high CGPA taking 20 minutes in an interview to convince the interviewer to recruit him/her as an engineer. They must know how to present and how to sell themselves. HMMSB stresses the need for soft skills besides the good academic grades. They should prepare themselves before interview especially their objectives for the interview.

Both respondents when asked for other comments regarding employability they would like to added the following:

i. universities should be proactive in order to collaborate with companies.

ii. universities have to look at the needs of industry, when they want to produce more graduates they have to take into consideration the future.

iii. in engineering, English communication is compulsory regardless of race. Trainees/employees must be fluent in English. Companies cannot help them but the university must assist them either in grammar or other aspects. Then they can come to industry and gain all the knowledge on offer to industry.

Conclusion

This study as identify the actual state was that the employers have no standard module or training package that could monitor the progress, standard and quality of the industrial training. There is no standard assessment tool to measure the engineering students' knowledge throughout the industrial training. How ever does this affect the industry transferable skills, knowledge and experience to the trainees? The researcher will further this study to another level but the findings were excluded in this paper.

In the researcher's opinion, to have a well organised standard module is better. Future development of training upgrading can be done and documented to achieve the training objective and quality. This may sound idealistic but it can be done for the better future of manpower development.

The employer's interview had contributed evidence that based on the weakness of the student's performance on documentation writing, they need more guidance from the university. The employers also would like the university to review the curriculum to balance the theoretical and practical aspect of the engineering education. According to the employers, there is evidence that students find it difficult to understand and perform during their placement in the industry. Thus, the finding of this study suggests that both university and industry have to work on the collaboration agreement to see how each party can complement each other.

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